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THE NATURALIST BRAZILIAN EXPEDITION

PAPER I.—FROM RIO DE JANEIRO TO PORTO ALEGRE.

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THE coasting steamers from Rio de Janeiro to Montevideo keep almost constantly within sight of land—rugged gneiss mountains of the Brazilian coast range, giving place, beyond Santa Catharina, to lower hills. Finally, near S. lat. 29° , the rocks disappear altogether; in their stead appear rows of sand-dunes, often a hundred feet high, and extending inland as far as the eye can distinguish them. These dunes, stretching interminably along the shore, produce a curious mingled feeling of picturesqueness and desolation; piled and massed like snow-drifts, broken and repiled by the winds in strange forms, they have an almost mountainous outline. But the eternal still white is a fatigue to the eye; in most places one looks in vain even for the dusty bushes which usually grow in such places. Now and then a lonely fisherman's hut is descried or a half-buried wreck—grim relic of the dreaded *pampero*, or of the north-east "Carpenter wind," so-called because it strews the beach with planks and spars. All this coast is regarded as dangerous. It is entirely without harbors or shelter of any kind, and there are several shoals and sunken rocks, dreaded by mariners.

The sand-dunes form the seaward limits of Rio Grande do Sul, the southernmost province of Brazil. But they are not continuous with the mainland; a few miles back there are two great fresh-water lakes, parallel with the coast, and together extending along nearly the whole length of the province. The larger and

more northerly of these is called *Lagoa dos Patos* (Lake of the Ducks); the *Lagoa-mirim* (Smaller Lake) empties into this through the River Sao Gonçalo. Between the lakes and the ocean the dunes form two long peninsulas, varying in width from five to twenty miles. These peninsulas are entirely composed of sand, the drifted masses varied only with mangrove swamps and brackish or fresh-water lakes. They are perfectly barren, and almost without inhabitants.

The Rio Grande is the only passage through this sand-wall, and with some trifling exceptions the only outlet of the rich and populous province of Rio Grande do Sul. It is a shallow channel, twelve or fourteen miles long, half a mile wide at the ocean end, and gradually broadening towards the lakes. Unfortunately a very dangerous sand-bar has been formed before the mouth, which is yearly growing worse, and of late has caused serious apprehensions for commerce. In its formation this bar is altogether different from the shallows commonly found at the mouths of rivers. It has been built up, in great part, by the ocean currents and the north and north-west winds. The winds take up great clouds of sand from the dunes, scattering them broadcast before the channel; the currents sweeping south-westward along the coast catch up the sands as they fall, piling them in great banks over the shallows. The slight outflow from the Rio Grande serves to keep the detritus from accumulating directly in its mouth, and the bar forms a great semicircle around it. The Rio Grande itself brings very little sand or mud to the sea; I question, indeed, whether the tides are not washing the sea-coast sands through the channel into the lakes.

The condition of the bar varies greatly, more with the winds than with the tides; a long-continued south or south-west wind piles up the water, but even at the most favorable times the depth is seldom more than ten or eleven feet, and with a north wind the banks are almost dry. With a gale or even a strong east wind the bar becomes impassable on account of the surf; with a calm it is apt to shallow rapidly. Worst feature of all, these changes take place very suddenly and at irregular intervals, so that the bar is the very emblem of fickleness among the Rio Grande sailors. Old residents say that during the early years of this century the bar was even worse than it now is; about 1820 it was broken by a heavy storm, and after that, for forty years or

more, it gave little trouble. Since 1860 it has been constantly growing worse; two of the three channels are now impassable and the other threatens to become so. The Brazilian government has several times sent engineers to study the obstruction, and many schemes have been proposed for its removal, but all have been more or less visionary and the expense involved by carrying them out would be enormous. Yet the importance of the question is very great. A region as large as New England and with a thriving population of over 700,000 is threatened with complete commercial isolation. For if the Rio Grande channel is closed, all the lake ports will be shut off from communication with the ocean; the sea-coast itself is without harbors, and the nearest ports of Santa Catharina could only be reached by long and expensive railroads. It has been proposed to cut a ship canal from one of the lakes to the ocean, at some favorable point, and perhaps this would be feasible, but it would be necessary to make an artificial port at the ocean end of the canal, and even if the works were successfully completed, their utility might soon be destroyed by the formation of new sand-bars. In the midst of these conflicting schemes the Rio Grandenses are anxiously looking for another great storm which shall once more open their ports to the world.

As we approached this doughty bar we counted a dozen vessels lying outside, waiting for an opportunity to enter; some of them, we were told, had been there for six months. Inside of the bar at least an equal number were waiting for an exit. When the weather permits it a small boat is anchored over the bar, and soundings are constantly taken from it with poles; the depth is indicated by signal flags from the boat and from a tower on the shore. Owing to the sudden changes ship-masters are obliged to watch these signals very closely, so as to profit instantly by a favorable indication. We heard of one poor fellow, an American skipper, I believe, who had fretted and fumed for four months inside of the imprisoning bar; his small fortune was dependent on the success of a voyage for which he had contracted, and which the bar threatened to prevent. One day the signals suddenly went up to twelve feet, the depth which his ship required. Overjoyed he at once weighed anchor and ordered all sails to be set; but as he approached the bar the flags came down again, and he was obliged to turn back. The chagrin and disappointment were

so great that some brain trouble ensued, and the man died that night. Other ship-captains under similar circumstances have pushed on in spite of the risk, trusting to good luck to scrape through the obstruction; half a dozen wrecks lying on the shallows show the results of such hardihood.

Luckily for us the signals marked eight feet and three inches, just our draught, and we were able to pass without stopping. Led by the little pilot-steamer, ycleped *Manoel o Diabo* (Emanuel the Devil) we threaded the crooked channel, scraping a little in the shallowest part, where the surf was lively enough. In the Rio Grande the navigation is still somewhat difficult, and the deeper portions are marked out with buoys.

Eight or nine miles from the sea, on the western side of the channel, is the city of Rio Grande, the commercial metropolis of the province. It is built on a peninsula of the sand-dune region, but the main streets are well paved, and some attempts have been made at arborization; there is a fine public garden where willows and palm-trees are intermingled, and roses and dahlias grow side by side with splendid tropical camellias. Hedges near the city are formed of large shrubby mimosas, or of candelabra cacti (*Cereus*). In one place a grove of *Eucalypti* has been planted, and the trees appear to thrive well. The only plants that grow naturally on the peninsula are the marsh grasses and reeds, the mangrove bushes and a few inconspicuous herbs. Yet it is said that with the addition of a small amount of fertilizing material, the land may be made very productive; in fact, the Rio Grande market is abundantly supplied with vegetables which are thus grown on sand-islands near the city.

Rio Grande contains about 14,000 inhabitants, mostly whites of Portuguese descent, though there are a good many foreign merchants. The city is exclusively dependent on commerce for its existence, the country immediately around it producing almost nothing. The principal articles of export are jerked beef and hides, with much tallow, horns, wool, tobacco and rice, but no coffee, sugar or cotton. Rows of warehouses front the river, where a fine wide quay has been built; here large ships may discharge their cargoes directly on the land. There are some good public buildings, including one of the finest custom-houses in Brazil; this is covered with cement, in imitation of marble, and its architecture is much superior to that of most public works in the em-

pire. The market, like most of those in this province, consists of two rows of stalls, with a passage between, running around a great open court, in which are other stalls for the sale of fruit, vegetables and small wares. Fine grapes, grown in the province, were plenty here, and cheaper than in New York; pears, apples, peaches, tomatoes and so on were also native, but those we saw were high priced and not very good. Oranges, at this season (January), were scarce and dear, but from May to September they are very plenty, and hardly inferior to those of Bahia and Pernambuco.

Opposite Rio Grande, on the eastern side of the channel, is the village Sao José do Norte. Formerly this was the main port, and it is still used for coal, lumber and marine stores.

We stopped but a few hours in Rio Grande, our objective point being Porto Alegre, the capital of the province, which lies at the northern end of the Lagoa dos Patos. Communication between the two places is kept up by means of excellent small steamers, which leave Rio Grande once or twice every week. Our own voyage was somewhat uncomfortable and crowded, for in addition to the large number of first-class passengers, the decks were entirely occupied by nearly three hundred Italian immigrants who had just arrived. These were lively, and picturesque, and dirty, as the manner is with their race; as a class they appeared to be much superior to the average Italian immigrant of Castle Garden.

The river at Rio Grande is about two miles wide; generally fresh, but sometimes brackish or salt, with irregular and varying tides. Above this point it rapidly widens, but is much obstructed by sand-islands and shoals; the channel, a narrow and very crooked one, is indicated by rows of stakes. The river is simply a straitened continuation of the Lagoa dos Patos, but the southern end of the lake proper is considered to be at the island or shoal of Sarangonha, about fifteen miles above the city, and twenty-five from the sea. Just opposite this island, on the western side, is the mouth of the Rio de Sao Gonçalo, the outlet of the Lagoa Mirim. Steamers plying on the Lagoa dos Patos enter this river for a few miles to touch at the important little city of Pelotas, where the cattle-killing industry centers. The shores of the Sao Gonçalo are flat and reedy, with lines or clumps of low forest near the water's edge; ranges of hills appear a little inland, on the north-western side, but to the south a great sandy

or swampy plain extends to the ocean. The plain and the sandy islands in the lake are the resorts of many water-birds, white herons and ducks being particularly abundant. One species, called the *pato erminho*, or ermine duck, sometimes occurs in vast numbers, completely covering the small islands; from this bird the lake has taken its name. The skins of the *pato erminho*, with the larger feathers rubbed or pulled out, furnish a substance resembling swans' down; this is occasionally preserved by the Brazilians; but more as a curiosity than for use. It might be made a valuable article of export.

From Pelotas the steamers run directly to Porto Alegre, about twenty hours being occupied in the passage. The Lagoa dos Patos, through which our route lay, is the largest lake in Brazil, its length being over 130 miles, while its breadth varies from twenty to thirty-five miles. On the western side it is very shallow, and the shores are there bordered by swamps, which extend far inland; the only navigable channel is along the eastern side, skirting the sandy peninsula which separates the lake from the ocean. The winds sweep in freely over these low sand-hills, and in stormy weather the lake is very rough; navigation is then decidedly dangerous even for steamers. During the night we had a little taste of this in a heavy thunder-storm which broke over us, causing our small vessel to roll heavily; beyond this we suffered no inconvenience, and the storm soon passed; but to the immigrants on deck the night must have seemed a sorry introduction to their newly adopted country.

At its northern end the lake is split into two parts; the eastern one, bordering on the sand-dune region, receives several small streams; the western is a wide, deep estuary, called the Rio Guahyba. The mouth of the Guahyba is marked by rocky points on either side, but the lake may be looked upon as a continuation of the river. More broadly speaking, the lake is a geological result of the river; the long sand-spit which separates it from the sea has been formed by the joint action of the Guahyba and the ocean currents, probably during a period of subsidence. The formation of the lake is therefore similar to that of the sounds along the south-eastern coast of the United States. Only, in this case, the process has been carried farther; the lake has become almost completely separated from the ocean, and its waters are now fresh. I have not personally examined the Lagoa Mirim, but there can be

little doubt that it was formed in the same manner ; after existing for some time as an estuary of the small rivers which now flow into it, it was closed by the sand-banks, and its waters emptied into the ocean by the Rio de Sao Gonçalo ; the Guahyba estuary subsequently overlapped the mouth of the Sao Gonçalo, and when this estuary became a lake the Lagoa Mirim was reduced to the form of a tributary.

Owing to the shallowness of the lakes an immense evaporation takes place from them, and at certain seasons this nearly or quite balances the inflow from the rivers ; salt water may then pass in from the ocean to the southern part of the Lagoa dos Patos, filling the Sao Gonçalo channel, and even extending far up the Lagoa Mirim. The yearly outflow from the lakes, owing to the same cause, is very slight. This fact explains the irregular and feeble currents of the Rio Grande channel, and it is the real cause of the heavy bar at its mouth. If the outflow were strong and regular, or only influenced by the tides, the bar would have at least one permanent and deep passage through it, or at worst the question of removing the obstruction might be solved by means of jetties.

The Guahyba is very picturesque. High granite hills skirt the eastern shore, sometimes bare and precipitous, oftener with grassy slopes and forest-lined ravines. A few rocky islets are scattered over the channel ; one of them is used for a powder magazine and signal station, but there are no fortifications. For twenty miles above the lake the channel has an average width of five or six miles, but at Porto Alegre it is suddenly narrowed to less than a mile by two opposite projecting points. The southern point is low and bordered by swampy forest ; the northern, on which the city is built, is a granitic promontory about 150 feet high. This elevation, slight as it is, adds greatly to the picturesqueness of the place ; white and yellow-washed houses, with red tile roofs, are seen rising one above another, the public buildings crowning the hill with fine effect.

Of all Brazilian cities this is the least tropical in appearance, the architecture shows some traces of that degraded Roman type commonly seen in Spanish and Portuguese America, but even this is not very noticeable, and on landing we might have imagined ourselves in a seaport town of the United States. The streets are wide and well paved with porphyry from the surround-

ing hills, but they are badly drained and dirty—another reminder, perhaps, of New York and Philadelphia. For a wonder we found the hotels excellent and very reasonable in their charges; they all have French or Italian names, with what purpose it would be hard to say, for these nationalities are hardly represented in the city. There are about 35,000 inhabitants, mostly white Brazilians and Germans.

Standing on the summit of the promontory, near the president's palace, one may obtain a very close idea of the topography of the surrounding country. To the west and south, sweeping around the point, is the broad Guahyba; just above the city it is divided by many islands, receiving several branches which, spreading out like the fingers of a hand, have given to this part of the river the local name of Viamao (handway). Flat lands stretch away to the south-west, beyond the river; these are meadows and swamps, continuous with those which skirt the western side of the Lagoa dos Patos. To the east and north are beautiful rolling lands, once covered with forest but now occupied by pastures and farms; beyond these are other more rugged hills, forest or prairie-covered; and far to the north-west a blue flat-topped range can be descried, the edge of the interior table-land.

We made several short excursions around the city, noting the physical peculiarities of the region and getting our first glimpses of its fauna and flora. Lines of street cars run in various directions, affording very pleasant little excursions, and beyond these there are good roads and paths by the river-shore or among the hills and ravines. The country reminded us much of the Middle and Southern United States, yet there was a certain mingling of tropical features everywhere. The roads are broad and lined with hedgerows of mimosas and cacti; the houses, as usual, white-washed and tile-roofed, often with neat kitchen-gardens around them, where the tomatoes and cabbages reminded us yet more strongly of home. Roses and begonias grow half wild about the door-yards; peach and pear trees and rampant grape-vines running over trellises, are set off by rich, dark orange trees and great pale-green banana leaves. Everywhere there is the same mingling of tropical and temperate features; people, customs, architecture, animals and plants, the very air, changing from sultry to chill in a day, showed us that we were in a border-land, partaking of the character of two regions.

(To be continued.)